



## **Dmitry A. Kukuruznyak**

Principal materials scientist at the Animate Condensed Matter Company

*I create artificial animate matter that works like biological neural matter.*

*Scientific Expertise:* physics of living matter, artificial animate materials, hardware for artificial intelligence.

*Education:* Ph.D. in Materials Science and Engineering from [University of Washington](#), Seattle, WA, USA; M.S. in Physics from [University of Miami](#), Coral Gables, FL, USA; Diplom in Physics from [St. Petersburg State University](#), St. Petersburg, Russia.

*Professional Experience:* Max-Planck Institute for Intelligent Systems ([MPI-IS](#)), Germany; Max-Planck Institute for Solid State Research ([MPI-FKF](#)), Germany; National Institute for Materials Science ([NIMS](#)), Japan.

### **Scientific Profile**

I am a materials scientist working in the field of physics of life. I create conceptual, mathematical and physical models of living matter. I am using condensed matter physics to explain how simple biological organisms generate purposeful autonomous movements and how living neurons organize into coordinated groups to produce sensible collective actions.

I develop non-biological artificial animate matter that may serve as a counterpart of biological neural matter. My major goal is [strong artificial intelligence](#). I wish to create a free-willed intelligent machine that would see the environment, make decisions and solve problems by the laws of biology.

### **The Animate Matter Hypothesis**

I argue that biological life is a distinct condensed matter phenomenon that has a clear-cut physical definition. I define life as a [self-sustained collective chemical transformation](#). It is a process, during which chemically transforming molecules combine into collective structural rearrangements, which then generate new chemical transformations:

A living cell is an orderly condensed matter body, in which all molecules are connected to each other. There, molecular transformations acquire the ability to interact, coordinate their courses, and produce structural rearrangements, during which various segments of the cell move with respect to one another in orderly ways. These collective rearrangements perform so-called vital functions. They include: extraction of nutrients from the environment, their distribution across the cell, control of their chemical conversion, creation of new functional structures, followed by their integration into the

cellular body. As a result, the living cell replaces used elements with fresh ones, continually producing new actions.

In inanimate matter, molecules move in an uncoordinated manner by random thermal fluctuations. They do not realize their potential to make any order-producing actions.

Aristotle said that the defining characteristic of life is the ability of the organism to produce autonomous actions aimed at maintaining its structure and function. I determine the source of these actions (order-producing molecular transformations) and explain how these elementary actions combine into collective actions (by means of one common transforming condensed matter body, which brings together and reconciles individual movements). I use my explanation to make computational models of living matter and to produce artificial living-like objects.

### **The Animate Condensed Matter Company**

[Our company](#) makes artificial animate matter from non-biological raw materials. We rearrange their molecular structures, inject suitable metabolites, and initiate collective transformations. By modifying the structures of the artificial animate bodies, [we make them perform various useful tasks](#). In addition to the experimental research, we develop the theory of orderly movements of living matter.

The final goal of our company is [to fabricate the artificial brain that reproduces the actions of living neural networks](#).

### **Our results**

The Animate Condensed Matter Company was created to evaluate the efforts and resources needed to produce a living-like artificial brain. We have done the necessary research, [reaching the following conclusions](#).

The artificial animate structures can be created at the present stage of development of science and technology. They will be fabricated applying the methods used for manufacturing integrated circuits, albeit with significant modifications.

Most likely, the development of the artificial brain will not proceed through intelligent design. Instead, the synthetic animate life forms will develop through evolution and artificial selection. This approach implies manufacturing of a wide variety of different artificial animate species, followed by their testing, and choosing the best performing samples. The selected specimens will then be used for the fabrication of next generations of the animate forms. This implies the construction of a large ecosystem of the artificial animate organisms with different properties.

### **Hardware for Artificial Intelligence**

I wish to establish a research project for the development of [hardware-based artificial intelligence](#), and seek sponsorship for this initiative. I can organize a fully integrated research program that will coordinate basic scientific discovery, early-phase trials, and product development. I [invite interested individuals, organizations, and research institutes to participate in supporting this project](#). This offer is addressed to corporations and government agencies making long-term investments in robotics and strong artificial intelligence. I also appeal to the academic and research institutes developing the physical theory of life and intelligence.

The hardware-realized artificial intelligence may lead to the rise of intelligent self-guided robots, able to reproduce on their own. The potential stakeholders can gain control over this technology at the early stages of development.

## Contact

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[The Animate Condensed Matter Company](#),

[Moscow Animate Materials Center](#),

[Московский центр живоподобных материалов](#).

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